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Finite Horizons and the Twin Deficits

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This paper uses Blanchard's (1985) model to study the relationship between budget deficits and trade deficits. The model is applied to annual post-war data from the U.S., Japan, and Germany. I find that in all three countries there is a significant link between trade deficits and budget deficits, holding constant expected changes in GNP and government expenditure. However, the implied planning horizons are quite different across countries. In particular, the implied planning horizon in the U.S. is only about 3 to 4 years, whereas in Japan it is 71 years and in Germany it is 31 years.

The United States has run merchandise trade deficits for eighteen straight years. Including trade in services and net interest receipts alters the picture only slightly, for it shows the current account in deficit for fifteen of the past eighteen years. Many policymakers and journalists regard this recent experience as symptomatic of some combination of closed foreign markets and a secular decline in the "competitiveness" of U.S. products. Given this diagnosis, the remedy then appears obvious—first, pry open foreign markets where necessary through a process of aggressive tit-for-tat bargaining, and second, prevent a further erosion of U.S. technological leadership by providing government support to those industries that are deemed to be on the cutting edge of new technology, especially if their foreign counterparts are being subsidized.

This paper will argue that these policy prescriptions represent bogus cures for a nonexistent illness. Rather than reflecting a nefarious plot on the part of foreign governments to keep out U.S. products, or a gradual waning of American hegemony, recent U.S. trade imbalances represent to a large extent the predictable outcome of macroeconomic policies that have as much to do with the actions of Congress as they do with the actions of foreign governments. In particular, much of the size and persistence of aggregate trade imbalances can be attributed to shifts in national fiscal policies that in turn lead to shifts in national savings rates. If (at a constant interest rate) changes in fiscal policy do not systematically affect domestic investment rates, then, via a well-known accounting identity, equating current account deficits to the excess of domestic investment over national savings, fiscal policy will necessarily affect the current account. In particular, budget deficits will lead to trade deficits.

The assertion that budget deficits lead to trade deficits is not new. In fact, it has become the conventional wisdom within the economics profession. As with other policy issues, however, the economics profession has not been entirely successful at getting the message across. This lack of success can be ascribed to two factors, one theoretical and one empirical.

First, from a theoretical standpoint, there is no necessary link between budget deficits and trade deficits. Specifically, there will be no link if "Ricardian Equivalence" holds, that is, if individuals fully capitalize the implied future taxes associated with budget deficits, either because they expect to live long enough to pay the future taxes themselves, or because at the margin they value the wealth of their descendants as much as they do their own. If Ricardian Equivalence holds, then budget deficits that simply reflect the intertemporal shifting of (lump-sum) taxes will not affect national savings and the current account, because changes in private saving will fully offset changes in government saving (see Barro 1974). Moreover, we might observe a positive relationship between budget deficits and trade deficits for reasons unrelated to how the government finances its expenditures. For example, a budget deficit might not in fact signal higher future taxes if individuals expect the government to restore a balanced budget by cutting future government expenditures. In this case, the anticipated reduction in government expenditures raises private sector wealth and consumption, and therefore increases the trade deficit.[1] Alternatively, suppose a budget deficit occurs because the government reduces taxes on investment. In this case, even with full tax discounting we would expect to observe a current account deficit, not because national saving declines, but because domestic investment increases. The point is that these theoretical ambiguities provide ammunition for those who want to argue that the twin deficits are either an illusion or a coincidence. For example, conservatives tend to resist the idea because they fear it will be used as an argument for raising taxes. With perfectly valid economic arguments on both sides of the issue, the door is then left wide open for those who prefer the spurious arguments associated with foreign trade barriers or declining national "competitiveness." Clearly, the extent to which individuals discount future taxes is an empirical question, which can be settled only by empirical work. This brings us to the second factor behind the economics profession's failure to convince the public that it is macroeconomic policy that is to blame for persistent U.S. trade deficits.

On the face of it, existing empirical evidence against Ricardian Equivalence and thus in favor of the notion that budget deficits produce trade deficits is surprisingly weak, despite the apparently strong evidence presented by the experience of the U.S. during the 1980s.[2] Studies that examine different time periods or different countries have failed to produce reliable evidence that budget deficits are significantly related to trade deficits.[3] Part of the reason for this mixed evidence is undoubtedly due to difficulties that plague all empirical work in economics, e.g., difficulties in measuring the relevant theoretical concepts (in this case the budget deficit), and difficulties in adequately controlling for the many factors that simultaneously influence the variables of interest. However, I believe that in the case of the twin deficits, part of the reason also stems from a failure to conduct empirical tests within the context of a clearly specified intertemporal optimization model.[4]

An intertemporal approach makes it clear that if we simply regress current account deficits on contemporaneous values of budget deficits and on control variables like government spending, investment, and GNP, we should *expect* ambiguous results because the coefficients in this sort of reduced-form relationship are complicated functions of underlying parameters in the economy. Moreover, this ambiguity arises from the inherently dynamic nature of the twin deficits issue and in particular does not derive from the usual sorts of simultaneity bias that clouds econometric inference. For example, regardless of the horizon of individuals, or of whether Ricardian Equivalence holds, the coefficients on control variables like government spending can be either positive or negative, depending on the relationship between the horizon of individuals and the perceived persistence of government spending changes. Similarly, while the model in this paper predicts that the (partial) correlation between current account deficits and budget deficits is unambiguously positive, the magnitude of this correlation can be arbitrarily large or small for any finite horizon of individuals, depending on the perceived persistence of budget deficits. In other words, the size of the coefficient on budget deficits does not by itself tell us the extent to which individuals discount future taxes. Instead, a clear picture of the twin deficits relation requires a joint estimation of the process generating the current account and the processes generating budget deficits and the control variables, since economic theory places cross-equation restrictions on these processes.

The remainder of the paper is organized as follows. The next section develops a discrete-time version of Blanchard's (1985) model. In this model all individuals face the same

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1. Yi (1993) argues that there is some evidence that the U.S. trade deficit of the 1980s occurred because individuals expected future government purchases to decline.

2. For surveys of the empirical evidence on Ricardian Equivalence, see Bernheim (1987) and Seater (1993). Bernheim tends to stress evidence contradicting Ricardian Equivalence, while Seater tends to focus on studies that support Ricardian Equivalence.

3. For example, using a standard reduced-form regression approach, Bernheim (1988) shows that inferences about the strength of the twin deficits relationship depend critically on the country and time period, as well as on the conditioning information set.

4. A notable exception is the work of Leiderman and Razin (1988), who construct and test a model that is quite similar to the one in this paper. They apply the model to monthly data from Israel during the early 1980s and fail to reject the Ricardian Equivalence proposition.

constant probability of death. This probability imparts a finite horizon to individuals, and serves to parameterize the extent to which Ricardian Equivalence holds and the extent to which budget deficits affect the current account. Estimation of this parameter will be a primary focus of the paper. Section II discusses the data I use to estimate the model. Briefly, I apply the model to the U.S., Japan, and Germany, using as long a time series as I could obtain for each country. Section III presents the empirical results. Unrestricted estimates reveal a statistically significant (partial) correlation in all three countries between current account deficits and budget deficits. Restricted estimates, which allow us to infer the effective planning horizon of individuals, suggest wide disparities in the extent to which individuals internalize the government's budget constraint. The estimates range from a 3- to 4-year horizon in the U.S. to a 71-year horizon in Japan. Perhaps not surprisingly, however, the horizons are not estimated very precisely. In particular, their standard errors do not allow us to reject the hypothesis that the horizons are short and equal across countries. Section IV discusses some caveats and possible extensions to the paper.

I. THE TWIN DEFICITS IN A MODEL OF "PERPETUAL YOUTH"

This section briefly outlines a discrete-time version of Blanchard's (1985) model. The analysis and notation borrow heavily from the work of Frenkel and Razin (1987), and the interested reader is urged to consult their book for full details.

The model will be developed in four steps. First, I discuss the model's demographic assumptions. Second, I solve the intertemporal optimization problem confronting individual agents in the economy. Third, I aggregate the individual decision rules to arrive at an aggregate consumption function. In the fourth step, I incorporate domestic and foreign government borrowing, and derive an equilibrium law of motion for the economy's current account balance.

Demographics

Consider a world in which a new cohort of individuals is born each period. Without loss of generality, normalize the size of each new cohort to be one. All members of this cohort have the same probability of surviving from one period to the next, and more importantly, this survival probability remains constant throughout an individual's life. In other words, an individual's lifetime is like a sequence of coin tosses, the probability of living for another year being completely independent of the individual's current age. Clearly, these demographic assumptions are motivated by analytical convenience rather than by descriptive realism.[5] In particular, the assumptions that the survival probability is the same for everyone and that it remains constant over time greatly facilitate aggregation. In this world, the only redistributions that matter are between the currently living and the yet unborn. If allowance were made for more realistic individual life-cycle dynamics, then we would also need to worry about how government policy redistributes resources among all those who are currently living, each of whom will respond to the policy in a different way because of age differences.

Although the assumption of constant and identical survival rates is important, the particular values chosen for the birth rate and the death rate are inessential. For example, we know from Weil (1989) that virtually identical results can be derived in a framework in which individuals live forever and new (unrelated) individuals are born each period. In Weil's model the birth rate rather than the survival rate becomes the key parameter. In fact, by reinterpreting the parameters, the two models become observationally equivalent. Specifically, Blanchard and Weil's models will produce identical results if we set the birth rate in Weil's model equal to the death rate in Blanchard's, and then increase the interest rate in Weil's model by Blanchard's death rate.[6] Thus, a finite horizon per se is not the crucial issue here, although it provides a convenient story for debt nonneutrality. Instead, as noted by Buiter (1988), the crucial issue is that new individuals enter the economy each period, and that these individuals are unrelated (in utility terms) to currently alive individuals. These unborn individuals introduce a wedge between the government's future tax base and the future tax base of those who are currently living. This wedge then causes social and private discount rates to diverge, and it is this distortion that is the fundamental source of debt nonneutrality and the twin deficits.

Following Frenkel and Razin (1987), let γ denote an individual's probability of surviving from one period to the next. Then, from the previous assumptions, γ^t is the probability that an individual will live for t more years, and more generally, an individual's expected lifetime is

$$\sum_{j=1}^{\infty} j\gamma^j = \gamma/(1-\gamma)^2.$$

5. Blanchard cites evidence that survival rates are high and relatively constant from ages 20 to 40, but start to decline rapidly thereafter, reaching .99 at age 50, .97 at age 60, .84 at age 80, and .33 at age 100. To accord with this evidence on individual survival rates, Blanchard suggests an alternative interpretation of the model in which the basic unit of analysis is a dynastic household, and the survival rate refers to the probability that some member of the family continues to live.

6. See Glick and Rogoff (1994) for an application of Weil's model to issues in international macroeconomics.

Thus, in a very simple and convenient way, γ parameterizes the horizon of individuals. Finally, from our normalization that the size of a new cohort is one, the total population at any given time is constant and equal to $\sum_{j=0}^{\infty}\gamma^j = 1/(1-\gamma)$ (assuming that each cohort is large enough for the law of large numbers to apply).

Individual Optimization

Individuals are assumed to maximize their expected lifetime utility,

$$(1) \qquad \max_{\{c_t\}} \tilde{E}_0 \sum_{t=0}^{\infty} \delta^t U(c_t),$$

where δ denotes the individual's subjective rate of time preference and c_t denotes consumption during period t. The expectation operator in (1), $\tilde{E}_0$, reflects uncertainty over both the duration of the individual's lifetime and his or her future resources. The previous demographic assumptions allow us to write this as,

$$(2) \qquad \max_{\{c_t\}} E_0 \sum_{t=0}^{\infty} (\gamma\delta)^t U(c_t)$$

where now the expectation operator, E_0, only reflects uncertainty about future resources, and the consumer's effective discount rate has increased.

Individuals receive an exogenous stochastic labor income stream, $\{y_t\}$, which is assumed to be identical across individuals, and must pay a stochastic lump-sum tax of τ_t to the government during period t. In general, variation over time in disposable income will cause individuals to want to borrow and lend. However, no one will be willing to lend to an individual unless he or she receives a "risk premium" to cover the probability that the borrower will die before the debt is paid off. Specifically, let $R = (1+r)$, where r denotes the risk-free market interest rate. Then, in competitive equilibrium, the (gross) rate of interest on personal loans will be R/γ, since this guarantees an expected return equal to the risk-free rate.[7] Therefore, the individual's flow budget constraint is

$$(3) \qquad c_t = y_t - \tau_t + b_t - R/\gamma\, b_{t-1}$$

where b_t denotes period t issues of (one-period) private sector debt.

7. Following Yaari (1965), an alternative but effectively equivalent arrangement would have individuals buy life insurance policies in which insurance companies honor the debts of the deceased or receive their assets, whatever the case may be. Under this setup, borrowing and lending takes place at the risk-free rate, but adding in the individual's insurance premiums leads to an identical expected rate of return on human capital.

In solving for the individual's optimal consumption/saving plan, I assume the individual's period utility function is quadratic. Specifically,

$$(4) \qquad U(c_t) = \alpha c_t - \tfrac{1}{2}c_t^2$$

Maximizing (2) subject to (3) then gives the following linear, age-independent consumption function (assuming $\delta R = 1$),[8]

$$(5) \qquad c_t = [(R-\gamma)/R]\,[H_t - (R/\gamma)b_{t-1}]$$

where H_t denotes the capitalized value of the individual's expected future disposable income,

$$(6) \qquad H_t = E_t \sum_{j=0}^{\infty} \left(\frac{\gamma}{R}\right)^j (y_{t+j} - \tau_{t+j}).$$

Aggregation

Since it is assumed that labor, income, and taxes are the same for everyone, and the demographics imply an age independent consumption function, the only issue in aggregating concerns private sector indebtedness. Letting B_t denote aggregate per capita private sector debt, we have

$$(7) \qquad B_t = (1-\gamma) \sum_{a=0}^{\infty} \gamma^a b_{a,t},$$

where now $b_{a,t}$ denotes the debt at time t of individuals who are a years old. Aggregating both sides of the individual's budget constraint in (3) yields,

$$(8) \qquad B_t = R \cdot B_{t-1} + C_t - (Y_t - T_t),$$

where C_t, Y_t, and T_t denote aggregate per capita consumption, labor income, and taxes which, from our previous assumptions, are the same as c_t, y_t, and τ_t.

The point to notice is that at the *aggregate level*, the rate of return on private debt is just the risk-free market interest rate. From the law of large numbers, the risk premium is cancelled by those who die each period.

The Government

For simplicity, I assume the country in question is "small" in the sense that it takes as given the world interest rate, R. The main implication of this assumption is that application of the model to large countries will tend to exaggerate the effect of fiscal policy on the current account. This is because in large countries part of the effect of fiscal policy is reflected in the (world) interest rate.

At this point I also remind the reader of a second important assumption implicit in the above setup, namely, the

8. See, e.g., Frenkel and Razin (1987).

assumption that domestic output evolves exogenously, independent of both the current account and the government's fiscal policy. In principle, of course, we should make output endogenous by introducing a production function and modeling investment and labor supply decisions. After all, as was noted earlier, the current account balance is by definition the difference between investment and national saving. My strategy in this paper, however, is to see how much of the dynamics in the current account can be explained solely on the basis of fiscal policy-induced savings rate dynamics. The danger with this strategy is the potential of getting a misleading picture of the underlying reason why fiscal policy affects the current account, if indeed fiscal policy simultaneously influences both saving and investment.[9]

Having said this, we can now move on and derive an equation for the current account balance. First, define CA_t to be the economy's current account surplus. Remember that this is simply the economy's net acquisition of foreign assets during period t. Therefore, an economy will have a current account surplus when it spends less than it produces during a given period. That is,

$$CA_t = Y_t - G_t - C_t + rF_{t-1}, \tag{9}$$

where G_t denotes government purchases during period t, and F_t denotes the economy's *stock* of net external assets at the end of period t.

Now, if we difference both sides of the accounting identity in (9), and use the fact that, by definition $CA_t = F_t - F_{t-1}$, we get

$$CA_t = R \cdot CA_{t-1} + \Delta Y_t - \Delta G_t - \Delta C_t. \tag{10}$$

Next, aggregate the consumption function given in (5) and substitute it into (10), using the following three facts. First, note that by definition the sum of aggregate private sector indebtedness, B_t, and government debt, D_t, is equal to net external debt, $-F_t$. That is, $B_t + D_t = -F_t$. This allows us to write the aggregate consumption function in terms of aggregate per capita human capital, H_t, net external assets, F_t, and government debt, D_t. Second, use the government budget constraint,

$$D_t = R \cdot D_{t-1} + G_t - T_t \tag{11}$$

to write H_t in terms of expected future values of Y_t, D_t, and G_t. Third, note that the change in government debt, ΔD_t, is by definition equal to the government's (interest inclusive) budget deficit. Specifically, letting BS_t denote the government's time t budget surplus, we have $BS_t = -\Delta D_t$. Doing all this yields the following expression for the equilibrium current account balance,

$$\begin{aligned} CA_t = {} & \gamma CA_{t-1} + \frac{\gamma}{R} E_{t-1}(\Delta Y_t - \Delta G_t) \\ & + \left(\frac{R-\gamma}{R}\right) E_{t-1} \sum_{j=1}^{\infty} \left(\frac{\gamma}{R}\right)^j (\Delta G_{t+j} - Y_{t+j}) \\ & + (1-\gamma)\left(\frac{R-\gamma}{R}\right) E_{t-1} \sum_{j=0}^{\infty} \left(\frac{\gamma}{R}\right)^j BS_{t+j} + u_t. \end{aligned} \tag{12}$$

This equation is the main result of the model. It explains the current account balance in terms of five driving forces. The first component on the right-hand side of (12) represents an autoregressive effect which links persistence in the current account to the horizon of individuals. Specifically, the longer is the effective planning horizon, the more persistent are fluctuations in the current account. The second component on the right-hand side of (12) is a current period demand effect, which simply says that, all else equal, the current account surplus increases when available output increases this period more than does the government's demand for it. The third and fourth terms on the right-hand side of (12) are more interesting. The third term is a wealth effect arising from *expected* changes in government spending and output. If individuals expect government spending to rise faster than output, then private sector wealth declines. The decline in wealth reduces *current* consumption, and therefore increases the current account surplus (i.e., individuals begin to save now for the anticipated decline in their future disposable income). The fourth term on the right-hand side of (12) is what sets this model apart from standard applications of the Permanent Income Hypothesis to current account dynamics.[10] Specifically, it implies that budget deficits produce current account deficits. This, of course, is the "twin deficits" phenomenon. There are two points to notice about this component. First, it disappears when individuals have infinite horizons (i.e., when $\gamma = 1$). Holding current and future government spending constant, budget deficits just represent the intertemporal shifting of taxes. If individuals fully capitalize these future taxes then such tax shifting causes no wealth effects, which in this model is the only way fiscal policy can influence the path of the current account. The second point is that the effect of budget surpluses on the current account depends not just on the current realization of the government's budget surplus, but also on the *entire expected*

9. Glick and Rogoff (1992) develop an intertemporal optimizing model of the current account that simultaneously incorporates saving and investment dynamics. They focus their attention, however, on the importance of distinguishing global and country-specific productivity shocks, rather than on the effects of budget deficits.

10. See, e.g., Sheffrin and Woo (1990).

future path of the budget surplus. Finally, the last term in (12), u_t, represents revisions between period $t-1$ and period t of individual's expectations concerning future values of income, government spending, and the budget deficit. If expectations are rational, this term will be uncorrelated with anything in the time $t-1$ information set and will also be serially uncorrelated. Therefore, u_t is a valid regression equation error term.

Because the current account depends on expected future values of BS_t, Y_t, and G_t, in order to implement equation (12) empirically we must take a stand on the nature of the stochastic processes generating these variables. In general, there is every reason to believe that these variables are jointly determined within some larger economic system, and therefore should be forecasted using some sort of VAR. However, in the interests of simplicity, I employ the following univariate time series specifications for these variables:[11]

$$(13) \qquad BS_t = \alpha_1 + \alpha_{BS} BS_{t-1} + \epsilon_{1t}$$

$$(14) \qquad \Delta Y_t = \alpha_2 + \eta e^{\mu t} + \alpha_Y \Delta Y_{t-1} + \epsilon_{2t}$$

$$(15) \qquad \Delta G_t = \alpha_3 + \eta e^{\mu t} + \alpha_G \Delta G_{t-1} + \epsilon_{3t}.$$

Using these to evaluate the forecasting problems in (12) gives us

$$(16) \quad CA_t = \alpha_0 + \gamma CA_{t-1} + \alpha_{BS}\left[\frac{(1-\gamma)(R-\gamma)}{R-\gamma\alpha_{BS}}\right]BS_{t-1}$$
$$+ \alpha_Y\left[\frac{\gamma}{R} - \frac{\alpha_Y(R-\gamma)}{R-\gamma\alpha_Y}\right]\Delta Y_{t-1}$$
$$- \alpha_G\left[\frac{\gamma}{R} - \frac{\alpha_G(R-\gamma)}{R-\gamma\alpha_G}\right]\Delta G_{t-1} + u_t.$$

Equations (13)–(16) clearly illustrate the nature of the cross-equation restrictions implied by the model. In particular, note that the response coefficients in the current account equation depend on the autoregressive coefficients in the equations governing the evolution of BS_t, ΔY_t, and ΔG_t. As noted in the introduction, this makes it difficult to interpret single-equation regressions of the current account on other variables. For example, note that the response of the current account to changes in output and government spending can go either way, depending on the relative magnitudes of the horizon parameter, γ, and the persistence of changes in output and government spending, as determined by the parameters α_Y and α_G.

11. Note, G_t and Y_t are assumed to share a common (deterministic) trend which, from inspection of (12), cancels out of the current account equation.

Also note that the persistence of budget deficits plays an important role in determining the (contemporaneous) response of the current account to a budget deficit. In particular, the more persistent a budget deficit is expected to be, the more likely it is that currently alive individuals will die before taxes are raised, and therefore the larger is the wealth effect. However, as pointed out by Poterba and Summers (1987), even if budget deficits are very persistent, the wealth effect and therefore the (contemporaneous) response of the current account are small if individuals have "long" but finite horizons. For example, suppose $\gamma=.87$ and $R=1.02$, so that individuals have approximately a 51-year horizon and the real interest rate is 2 percent. Then, even in the limit as $\alpha_{BS}\uparrow 1.0$, the coefficient on BS_t is only .13.

Before concluding that the model produces small effects from budget deficits, however, it should be remembered that in a dynamic multivariate model, contemporaneous responses may understate the potential of budget deficits to affect the current account. This is because an initial response may cumulate over time before it begins to die out. Such amplification occurs in this model if $\gamma+\alpha_{BS}>1$. For example, suppose that $\gamma=.87$ and $\alpha_{BS}=.7$. In this case, the initial response of the current account to a budget deficit shock will only be about 15 percent the size of the response after just two periods.

II. THE DATA

The model in Section I is applied to annual post-war data from the U.S., Japan, and Germany. Of course, none of these countries satisfies the "small" country assumption of the model, but except for the U.S. during the 1950s and 1960s, the assumption might not be too bad. Due to data availability problems, the sample varies from country to country. For the U.S., the sample extends from 1950–1993, while for Japan and Germany I was forced to use shorter samples, 1960–1992 and 1968–1993, respectively. Data are from NIPA for the U.S., and from the OECD for Japan and Germany.

Without a doubt, the variable in the model that is most difficult to measure is the government budget deficit. In this paper I make no attempt to correct the standard reported series for any of the many potential biases to which these data are subject. Four points about the budget data should be made, however. First, for all three countries I measure deficits in reference to the "general" or "consolidated" government. That is, state and local balances are added to federal or central government balances. Second, since I define the budget deficit as the change in the government's debt, I use data on the interest inclusive deficit (as opposed to the primary deficit). Third, the data include social security payments and tax revenues. This becomes important for the U.S. and Japan starting in the late 1970s. Fourth, rather than express everything in real terms, I simply divide both sides of equation (16) by nominal GNP, and express everything as a share of nominal GNP.

Plots of the current account and budget surplus as a share of GNP are contained in Figures 1–3. These figures suggest that while there appears to be some sort of relationship between the twin deficits, the strength of the relationship varies over time. In general, the relationship appears to be closer in all three countries during the 1980s. The figures also illustrate that the two series are not always "in phase". These two facts suggest that it is important to control for other factors that are influencing the current account balance and to allow for some dynamics.

To get a better sense of the dynamics in the data, Figure 4 presents impulse responses computed from unrestricted bivariate VAR(2) models consisting of the current account and the budget surplus (both expressed as a share of GNP).[12] Note that in all three countries a positive shock to the budget surplus produces a current account surplus that peaks after two to three years, and then gradually moves back toward balance—a dynamic version of the twin deficits story. The main difference across countries is that Germany's response appears to be weaker and shorter-lived than in the U.S. and Japan, while the U.S. response appears to be more persistent than in Japan and Germany.

III. EMPIRICAL RESULTS

This section presents joint maximum likelihood estimates of the system of equations (13)–(16). In addition to the usual assumptions about the error terms, I remind the reader of two important statistical assumptions that are made when computing the estimates that impose restrictions on the nature of the economic equilibrium. First, remember that I am assuming output is exogenous. Of course, this cannot literally be true. Imports and exports affect GNP, just as GNP affects imports and exports. Still, what is important is that this feedback not be too strong. Otherwise we can expect to obtain inconsistent parameter estimates. The second assumption is that there is no feedback from an economy's external balance to its fiscal policy variables. Again, I regard this as a reasonable assumption, although some observers have argued that external balance considerations influence congressional budget deliberations. As noted in the introduction, however, most members of Congress seem to see other culprits behind the persistent

12. The equations are ordered so that changes in the budget surplus have no contemporaneous effect on the current account.

FIGURE 1

U.S.: CURRENT ACCOUNT AND BUDGET SURPLUS AS A SHARE OF GNP

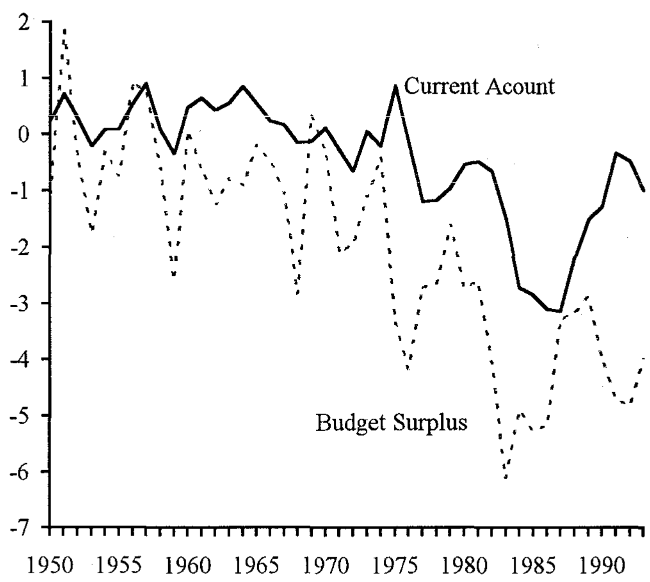


FIGURE 2

JAPAN: CURRENT ACCOUNT AND BUDGET SURPLUS AS A SHARE OF GNP

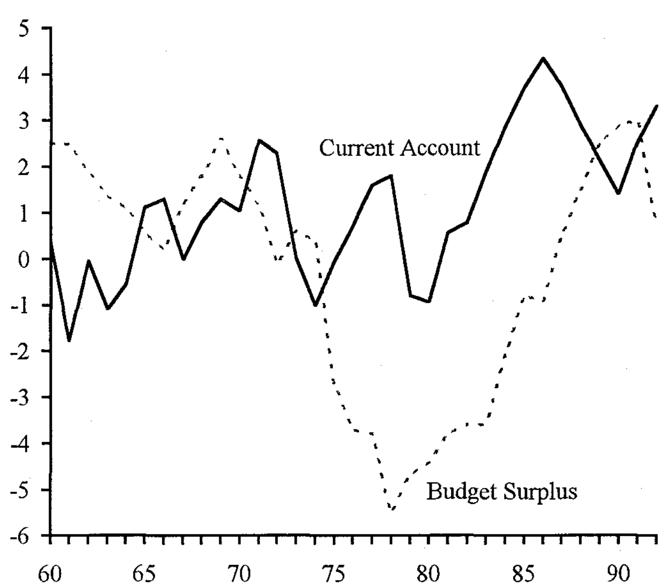


FIGURE 3

GERMANY: CURRENT ACCOUNT AND BUDGET SURPLUS AS A SHARE OF GNP

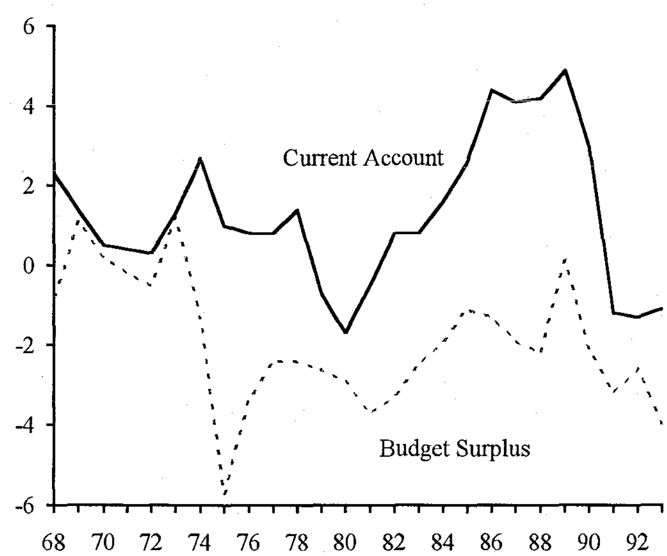
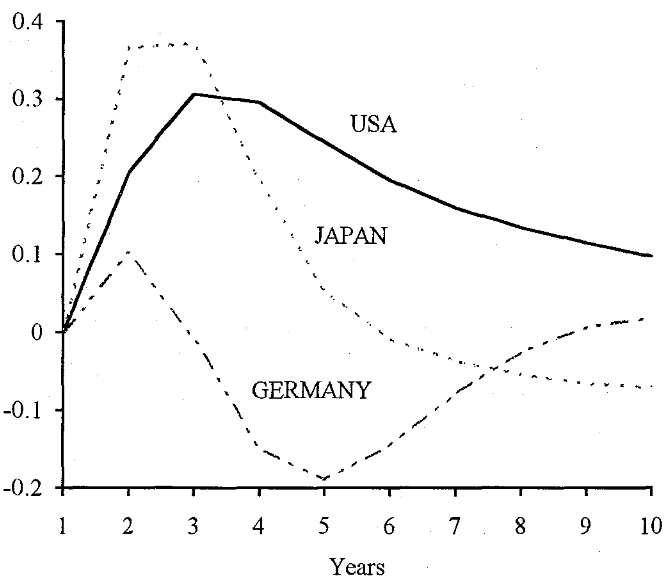


FIGURE 4

RESPONSES OF CURRENT ACCOUNT TO A SHOCK IN THE BUDGET SURPLUS (UNRESTRICTED VAR(2))



U.S. trade imbalance. In any case, if instrumental variables can be found, these exogeneity assumptions can be tested via a Hausman test, for example. If this test rejects we should resort to an Instrumental Variables estimator.

Before presenting estimates of the restricted system, let me briefly describe the results of unrestricted estimation of the current account equation. (Actually, I estimate the current account equation jointly with the other equations to take advantage of potential correlation among the error terms. I refer to the estimates as unrestricted because I do not impose the cross-equation constraints on the coefficients.) As noted earlier, only in the case of the budget surplus do we have any expectation concerning the sign of the coefficient. In particular, if the twin deficits hypothesis is valid, the coefficient on BS_t should be positive. This is indeed the case. Unrestricted estimates of the budget surplus coefficient are .266, .064, and .515 for the U.S., Japan, and Germany, respectively. The associated t statistics are 5.26, 0.82, and 2.68.

Finally, Table 1 contains estimates of the underlying parameters, derived by imposing the cross-equation restrictions. In each case I simply fix the value of the interest rate to be 2 percent, i.e., $R=1.02$.[13] The first point to notice is that the fit of the model appears to be reasonably good, in the sense that the current account equation explains 82 percent of the variation in the U.S. current account, and about 60 percent of the variation in the Japanese and German current accounts. On the down side, however, note that for Germany the cross-equation restrictions are soundly rejected, as the 5 percent critical value for a $\chi^2(3)$ random variable is only 7.81. Also note that for the U.S. and Germany there is borderline evidence against the hypothesis of no residual (first-order) autocorrelation. This casts doubt, beyond the usual small sample considerations, on the validity of the standard errors.

Turning to estimates of the horizon parameter, γ, note that while this parameter appears to be relatively precisely estimated, when we feed these estimates into the formula for an individual's expected lifetime (i.e., $\gamma/(1-\gamma)^2$), we get far less precise estimates of the effective planning horizon. For example, the 95 percent confidence intervals reported below the horizon estimates indicate that we cannot even reject Ricardian Equivalence (i.e., an infinite horizon) for Japan and Germany. This is because the

13. From (12), what matters is the effective discount rate, γ/R. Raising R should increase our estimate of γ by the same percentage. For example, if initially $R=1.02$ and we estimate $\gamma=.8$, then increasing R by 1 percent to 1.0302 should lead to an estimate of $\gamma=.808$. I tried estimating the model for a 1 percent and 3 percent real interest rate and found that the results changed little and in the predicted direction.

formula starts to become quite sensitive to small variations in γ once γ starts to reach about .80. Of course, this is not too surprising since, with discounting, it makes very little difference whether we calculate present values including 50 years or including 100 years. In other words, we will never be able to tell reliably whether individuals have 50-year planning horizons or whether they have 100-year planning horizons. Fortunately, this sort of distinction is rarely important in economic policymaking. Of potentially more importance, however, are differences like that exhibited by the U.S. and Japan, in which the U.S. is estimated to have a horizon of only a few years, while Japan is estimated to have a horizon of about 70 years. Of course, differences of this magnitude should manifest themselves in other data sets. Thus, it would be of interest to cross-check these results with other studies. One example of a study yielding results on the implicit planning horizon of individuals is Hayashi's (1982) paper on the Permanent Income Hypothesis. Using time-series data on aggregate U.S. consumption and income, Hayashi's estimates imply roughly a 10-year planning horizon. One potential explanation of this relatively short horizon, pursued by Hayashi, is that part of the U.S. population is subject to liquidity or borrowing constraints, making their behavior appear myopic. For example, his estimates suggest that approximately 17 percent of the U.S. population faces binding liquidity constraints. However, while liquidity constraints might explain a low-horizon estimate for a particular country, such constraints seem ill-suited to explain the cross-sectional difference between the U.S. and Japan. That is, it seems implausible that capital market imperfections are more severe in the U.S. than in Japan.

TABLE 1

RESTRICTED ESTIMATES OF EQUATIONS (13)–(16)

	USA	JAPAN	GERMANY
Sample	1952–1993	1962–1992	1970–1993
γ	.596	.888	.836
	(.078)	(.063)	(.131)
αBS	.738	.908	.553
	(.077)	(.061)	(.137)
αY	.894	.473	.395
	(.082)	(.153)	(.147)
αG	.775	.772	.208
	(.109)	(.094)	(.194)
Horizon	3.66	71.3	31.1
	(1.40, 12.2)	(13.4, ∞)	(3.2, ∞)
R^2	.82	.59	.56
h stat	1.95	1.01	1.82
LR(3)	6.31	3.69	20.7

NOTES:
Asymptotic standard errors in parentheses.
Horizon computed as $\gamma/(1-\gamma)^2$.
R^2 and h stat pertain to the current account equation.
LR(3) is the likelihood ratio statistic for the system's three overidentifying restrictions.

IV. CONCLUSION

This paper developed and estimated a dynamic econometric model of the current account. This model links persistence in trade imbalances to the effective planning horizons of individuals. The longer their horizons (as measured by their "expected lifetimes"), the more persistent will be the economy's aggregate trade imbalances. The model also illustrates the importance of individuals' horizons to the notion of the "twin deficits". All else equal, the longer individuals' horizons are, the weaker will be the relationship between budget deficits and trade deficits. This is because budget deficits affect the economy solely by altering the timing of taxes. Shifting taxes to the future by running a budget deficit will not create much of a wealth effect if individuals expect to be around to pay the higher future taxes.[14] Not surprisingly, it is difficult to estimate this parameter precisely using relatively short time-series data. Nonetheless, the point estimates suggest wide disparities in planning horizons among the U.S., Japan, and Germany. Specifically, the U.S. seems to have a much shorter effective planning horizon than Japan, with Germany somewhere in the middle. It would be interesting to cross-check these results using more direct, and probably more reliable, micro data sets.

Finally, in deriving these results I have made many simplifying assumptions. Future work along these lines should attempt to relax some of these to make sure the inferences hold up. Probably the two most important extensions would be, first, to "endogenize" output movements by modeling investment, and second, to relax the "small country" assumption by allowing a country's fiscal policy to affect the equilibrium world interest rate.

14. Or they expect their children, or other people they care about, to be around.

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